

(19)



Europäisches Patentamt

European Patent Office

Office européen des brevets

(11)

EP 0 845 390 A2

(12)

## EUROPEAN PATENT APPLICATION

(43) Date of publication:  
03.06.1998 Bulletin 1998/23

(51) Int. Cl.<sup>6</sup>: B60R 1/06

(21) Application number: 97120874.9

(22) Date of filing: 27.11.1997

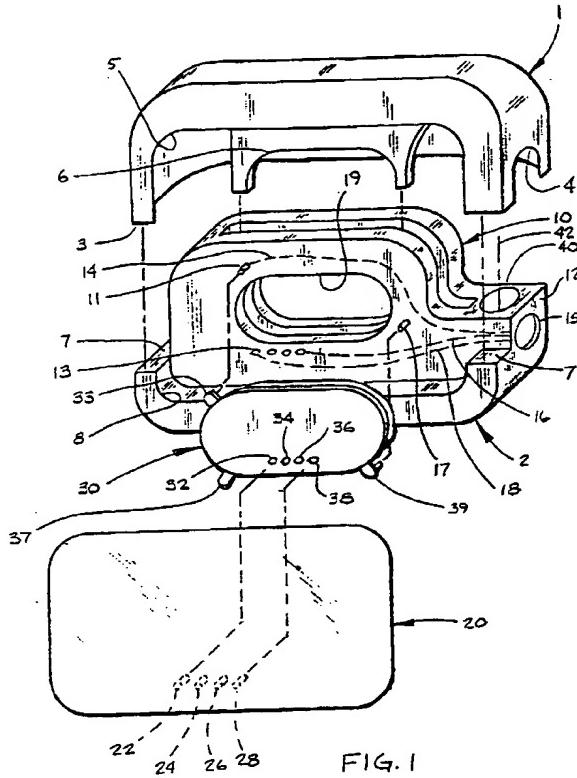
(84) Designated Contracting States:  
AT BE CH DE DK ES FI FR GB GR IE IT LI LU MC  
NL PT SE  
Designated Extension States:  
AL LT LV MK RO SI

(30) Priority: 29.11.1996 DE 29620775 U  
25.11.1997 US 978593

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### (54) Modular exterior rearview mirror assembly

(57) An exterior rearview mirror for vehicles includes a housing, a mirror support, a mirror element and other elements such as a mirror actuator or lighting unit each formed as a separate module and connected to each other by plug type or locking connectors. Electric conductors are integrated in the modules and/or connectors. A lower housing part receives an upper housing part along corresponding, generally horizontally extending, contact surfaces to form an exterior surface on the assembly.



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## Description

### BACKGROUND OF THE INVENTION

This invention concerns exterior minors for vehicles, and especially an exterior minor including a housing, a mirror or glass support and minor element or glass body formed in separate modules which are connected to each other by plug type or locking connectors. In addition, the invention relates to the inclusion of energy supply wires or electrical conductors for electrically driven components which are integrated in the modules and/or in the plug type and locking connectors.

Prior known rearview minor assemblies, and especially exterior rearview minor assemblies have required the careful assembly of various components in a piece-meal and time consuming fashion. The present invention considerably simplifies the former style of conventional motor vehicle exterior minors typically used on passenger cars, vans, or motor trucks. In addition, because the exterior minor is a vehicle part which projects from the vehicle body and thus forms the extreme lateral extension of a vehicle, the present invention also expands the functionality of the exterior mirror and takes advantage of its position on the vehicle.

### SUMMARY OF THE INVENTION

The present invention discloses a housing, a minor or glass support and a minor element or glass body for an exterior rearview minor for vehicles which are separately formed modules linked together by plug type and locking connectors. Consequently, the logistic expense for manufacturing the wide variety and continuously growing diversity of exterior minors for varying vehicles is considerably reduced.

In the event the exterior minor has a built-in, adjustable mechanism or actuator for the minor or glass element or body, it is preferred that the actuator be included as an additional separate module which can be plugged into or locked with the minor support and minor element.

Furthermore, it is preferred to imprint electrical strip conductors on the mirror or glass support and to provide suitable electric contact pins on the actuator mechanism for contact with the strip conductors through connection with the minor support. A preferred version of the invention provides for integrated electric heating in the minor glass body module with terminal lugs which make contact with the strip conductors when in connection with the minor or glass support. Moreover, the housing is preferably made of two separate parts, for example, an upper and lower part which, when assembled, can be locked together enclosing the minor or glass support. For purposes of good torsional stability, it is also preferred that the minor or glass support and/or housing parts be in a clam-shell shape. The minor glass

support includes an electric plug type connector whose contacts are connected with the strip conductors at a position close to the minor base.

In other forms of the invention, a light module is attached to the front exterior mirror. Such a module or light module can encompass particular functions such as turn, stop and position signals, or can be built as a multi-functional element which combines the previously mentioned signals, i.e., incorporates all of these ways of giving signals in a single light module.

In one preferred embodiment of the invention, the housing is composed of a lower and upper parts. The lower part includes as an appropriate support module adapted to the mirror or glass body and/or the mirror or glass support, to the adjustable driving mechanism or actuator for the mirror or glass support and/or mirror or glass body, to the light module, as well as to the housing upper part. The housing lower part includes a support module and, thus, is the module which establishes the connection to and support on the vehicle and the necessary electrical units. Preferably, the housing lower part, on the side closest to the vehicle, has an articulated pivot or link which also includes the appropriate electrical contacts. These can be placed on the lateral forepart of the articulated link or pivot or on ist cover or bottom area. Preferably, the electrical contacts are sliding contacts.

In addition, the light module itself is placed on the far side of the housing lower part from the vehicle and is located on the exterior of the housing so that it is flexible and adaptable as a module and not an integrated component. To this end, the housing upper part has a protruding tongue overlapping the light module on the side farthest from the vehicle. From a purely optical point of view, the overall exterior minor then appears as one single unit. The light module is also provided with necessary electrical contacts such that the light module can be fitted to the housing lower part support module by means of a dovetail joint. The electrical contacts are arranged and shaped on the light module so that they will accommodate or be included in the dovetail joint.

The articulated link or pivot of the housing lower part has a vertical bore or hole for receiving a pivot pin allowing the entire exterior minor to be rotatable and pivotable. On the side of the housing upper part which is closest to the vehicle, a cap is placed on the articulated link or pivot, or at least partially containing that link or pivot. The cap extends over the articulated link or pivot of the housing lower part. The cap also includes an axial bore or hole, coaxially aligned with the bore hole of the articulated link or pivot so as to create optical unity when viewed from the exterior.

These and other objects, advantages, purposes and features of the invention will become more apparent from a study of the following description taken in conjunction with the drawings.

## BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is an exploded perspective view of the first embodiment of the modular exterior rearview mirror assembly of the present invention, and

Fig. 2 is an exploded perspective view of a second embodiment of the modular exterior rearview mirror assembly of the present invention.

## DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawings in greater detail, a first embodiment of the invention is shown in Fig. 1. The housing is composed of an upper part 1 and a lower part 2 made of highly shock resistant synthetic material and designed as a clam shell. Upper part 1 has the shape of a somewhat elongated reversed U and terminates in a curved lower surface 3 provided with connectors or stop links. On the end facing the position of the vehicle on which the mirror is intended to be mounted, upper part 1 has a roughly circular opening 4 which partially receives the mirror base end extremity of minor or glass support 10 when assembled. On the rear side with respect to the direction of motion, housing part 1 is provided with a half opening 5 which locks the minor or glass body 20 in the upper area after assembly. In addition, a fork 6 is shaped from the upper housing part 1, displaced inwardly in relation to the half opening 5, and receives in between an adjustable mechanism or actuator 30 for mirror or glass body 20.

Lower housing part 2 corresponds to the upper housing part 1, resembles a tub, and has an upper periphery 7 which is provided with counterlocking devices or connectors which receive those on the upper part. Thus, upper housing part 1 is locked into place with the lower housing part 2 by means of locking devices provided in areas 3 and 7. On the end closest to the vehicle, lower housing part 2 has an upward opening corresponding to opening 4 such that the base end or near extremity 12 of mirror or glass support 10 is caught between the upper housing part 1 and lower housing part 2 when these are connected. Lower housing part 2, like upper housing part 1, is made of highly shock resistant synthetic material and is also designed as a clam shell. Edge 5 of upper housing part 1 blends into edge 8 of lower housing part 2 encompassing the mirror or glass body 20 from below after assembly.

Mirror or glass support 10 is also made of strong, synthetic material and designed as a clam shell showing the shape of a kind of hollow plate. Through appropriate shapes in the interior of the upper housing part and lower housing parts, mirror or glass support 10 is contained inside the space surrounded by housing parts 1 and 2. Several electric strip conductors 14, 16, 18 are imprinted on the synthetic material of mirror or glass support 10. These are electrically connected with

pins of a tip jack 15 provided in the extremity 12 of mirror support 10. Each strip connector ends in a jack 11, 13, 17 shaped in the material of the glass support, each having an electric conductive strip inside. Furthermore, mirror support 10 has a central, somewhat elliptical opening 19 into which the appropriately shaped adjustable mechanism or actuator 30 for mirror or glass support 20 can be inserted and locked. The actuator has a somewhat elliptical housing receiving the electric regulating motors for mirror or glass body 20. The electrical connections of the driving motors are linked with contact pins 33, 37, 39 protruding sideways from the body of the actuator 30 such that, when assembling the actuator, they reach the openings in jacks 11, 13, 17 where they make an electrical connection with strip conductors 14, 16, 18.

When the mirror or glass body is provided with integrated heating and/or is composed of an electrochromic mirror, electric contact pins 22, 24, 26, 28 are lined up side by side on the back of the mirror or glass body. These are locked in jacks 32, 34, 35, 38 on the front side of the housing of the adjustable mechanism or actuator 30. Each of these jacks 32, 34, 36, 38 contains an electric contact, which either leads to an additional connection on each contact pin 30, 37 or 39 or is looped through the housing of actuator 30 and makes contact with the same existing strip contactors when positioning the actuator housing in opening 19.

The base side extremity of glass support 10 is vertically drilled for insertion of a pivot pin through bore hole 40, whereby the folding and swivelling or pivoting axis 42 for the mirror subassembly, in relation to the mirror base, extends along the centerline of the bore hole 40.

A second embodiment 50 of the exterior rearview mirror assembly is shown in Fig. 2. A housing lower part 52 forms the actual support module for all other adaptable modules as well as housing upper part 53. Housing lower part 52 includes a saddle part 62 on which is arranged, for example, adjustable driving mechanism or actuator 57 or mirror glass support 54 for the adjustment of the position of mirror or glass body 55. On side 63 of saddle part 62, facing the direction of oncoming traffic, and on side 64 facing the rear side which is opposite the oncoming traffic direction, shaped brackets 65 and 66 are provided on which housing upper part 53 partially rests. Brackets 65 and 66 can also be part of light module 56. Brackets 65 and 66 are not overlapped by housing upper part 53 such that bracket 65, for example, has on its forepart 67 a useful arrangement of signal giving light emitting diodes (LEDs) 68. Light module 56 is placed on end 73 of the housing lower part 52 which is farthest from the vehicle. In order to insure electrical flow, light module 56 consists of contacts 76 schematically represented in Fig. 2, which are connected with appropriate counter contacts of housing lower part 52 designed as the support module. All types of connections assuring a simple and easy assembly

should be considered. On end 60 of housing lower part 52 which is designed as the support module, a protruding articulated link 58 is provided at the side of saddle part 62. Since housing lower part 52 establishes the actual connection with the vehicle, the appropriate electrical contacts 59 must also be provided here. For example, they can be located on the cover side 71, bottom area 72, or the lateral forepart 70 of articulated link 58.

For practical reasons, contacts 59 are made as sliding contacts. In order to receive a pin, articulated link 58 is provided with a bore hole 77 through which runs a pivot axis 69. Housing upper part 53 fits the lower housing part 52, at least partially, in a saucer-type configuration. On end 61 closest to the vehicle, a cap shape 78 extends over articulated link or pivot 58 of housing lower part 52. In the cap, an axial bore hole 79 is provided which fits coaxially with bore hole 77 of articulated link 58. On end 74 farthest from the vehicle, a protruding tongue 75 extending to the light module 56 juts out from the housing main part. Light module 56 can be subdivided into various signal sectors 80, 81 as represented in Fig. 2.

While several forms of the invention have been shown and described, other forms will now be apparent to those skilled in the art. Therefore, it will be understood that the embodiments shown in the drawings and described above are merely for illustrative purposes, and are not intended to limit the scope of the invention which is defined by the claims which follow.

### Claims

1. An exterior rearview minor assembly for a vehicle comprising:

a housing,  
a mirror element; and  
a mirror support for mounting said element within said housing;  
said housing including an upper part, a lower part, and a connection for mounting said assembly on a vehicle; each of said upper and lower parts having an exterior wall defining a shell having a rim for partially enclosing said mirror support and mirror element and exposing said mirror element for viewing, said shell on each of said upper and lower parts terminating in generally horizontally extending, curved contact surface, said contact surfaces corresponding with an engaging one another and forming a horizontal joint at which said upper and lower parts are joined together, said shells combining to form an exterior surface on one side of said assembly, and an opening exposing said mirror element for viewing on the side of said assembly opposite said one side when said upper and lower parts are joined at said contact surfaces.

5           2. The mirror assembly of claim 1 including an electrical actuator having at least one motor which adjusts the position of said mirror element, said actuator mounted on said mirror support within said housing.

10           3. The mirror assembly of claim 2 wherein said actuator and said mirror support include plug and socket connections for locking said actuator on said mirror support.

15           4. The mirror assembly of claim 3 wherein said mirror support includes electrical conductors for connecting said actuator to a source of electrical power, said electrical conductors being connected to said actuator through said plug and socket connections.

20           5. The mirror assembly of claim 4 wherein said mirror support includes a surface on which said electrical conductors are formed, said electrical conductors extending from said connection for mounting said assembly to the vehicle to said plug and socket connections.

25           6. The minor assembly of claim 5 wherein said connection for mounting said assembly to the vehicle includes a pivot whereby said housing may be folded with respect to the vehicle, said electrical conductors including strip conductors forming sliding contacts on a surface adjacent said pivot.

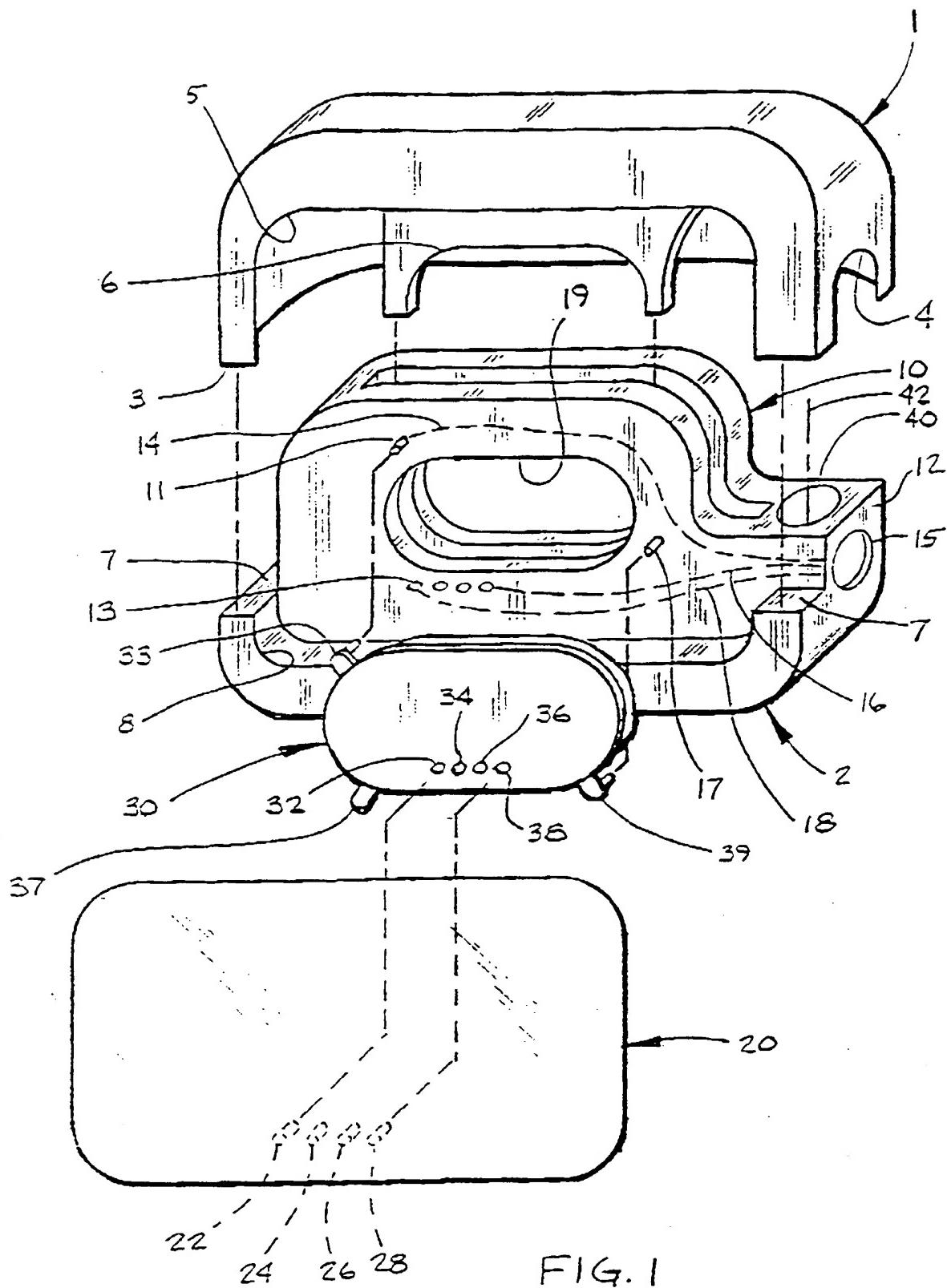
30           7. The mirror assembly of claim 4 wherein said mirror element is selected from the group consisting of a heated mirror element and an electrochromic mirror element, said mirror element and said actuator including plug and socket electrical connections whereby electrical connections are established from said electrical conductors on said mirror support to said selected heated or electrochromic mirror element through said actuator.

35           8. The mirror assembly of claim 2 wherein said mirror support includes an opening therein, said actuator being mounted in said opening.

40           9. The mirror assembly of claim 1 including a light module mounted on said mirror support; said mirror support including electrical conductors for conducting electricity from said connection for mounting said assembly to the vehicle to said light module when mounted on said assembly.

45           50           10. The mirror assembly of claim 9 wherein said connection for mounting said assembly to the vehicle includes a pivot whereby said housing may be folded with respect to the vehicle, said electrical conductors including strip conductors forming sliding contacts on a surface adjacent said pivot.

11. The mirror assembly of claim 9 wherein said light module includes electrical contacts engaged with said electrical conductors on said mirror support when said light module is mounted on said assembly.
12. The mirror assembly of claim 9 wherein said assembly includes a first end including said connection for mounting said assembly on the vehicle and second end opposite said first end and spaced farthest from said connection; said light module mounted at said second end.
13. The minor assembly of claim 9 wherein said light module includes a plurality of signal sectors.
14. The minor assembly of claim 1 including at least one light emitting diode mounted on said housing to provide signals.
15. An exterior rearview mirror assembly for a vehicle comprising a housing, a mirror support, a mirror element, and a light module each formed as a separate module and connected to each other by plug-type and locking connectors, said assembly including electrical conductors integrated in said modules and in said plug-type and locking connectors whereby electrical energy is provided through said light module.
16. The exterior mirror assembly of claim 15 wherein said light module is a turn signal.
17. The exterior mirror assembly of claim 15 wherein said light module is a stop light.
18. The exterior mirror assembly of claim 15 wherein said light module is a multifunction element.
19. The exterior mirror assembly of claim 15 wherein said housing includes a lower part and an upper part, said lower part being a support module receiving said mirror support, said mirror element, an adjustable actuator for adjusting the position of said mirror element, said light module, and said housing upper part.
20. The exterior mirror assembly of claim 19 wherein said housing lower part includes a pivot connection having electrical contacts therein.
21. The exterior mirror assembly of claim 20 wherein said electrical contacts are placed on a surface of said pivot.
22. The exterior mirror assembly of claim 21 wherein said electrical contacts are sliding contacts.
23. The exterior mirror mirror assembly of claim 20 wherein said pivot connection has as vertical bore hole for the purpose of receiving a pivot pin.
24. The exterior mirror assembly of claim 23 wherein said housing has a first end closest to the vehicle and a second end farthest from the vehicle, said housing upper part includes a cap on said first end extending over said pivot connection on said housing lower part.
25. The exterior mirror assembly of claim 24 wherein said cap includes an axial bore hole, coaxially aligned with said vertical bore hole of said pivot connection.
26. The exterior mirror assembly of claim 19 wherein said housing has a first end closest to the vehicle and a second end farthest from the vehicle, said light module being mounted on said second end of said housing lower part.
27. The exterior mirror assembly of claim 26 wherein said light module is located on the exterior of said housing.
28. The exterior mirror assembly of claim 26 wherein said housing upper part includes a protruding tongue overlapping said light module on second end of said housing.
29. The exterior mirror assembly of claim 15 wherein said light module has electrical contacts engaging said electrical conductors



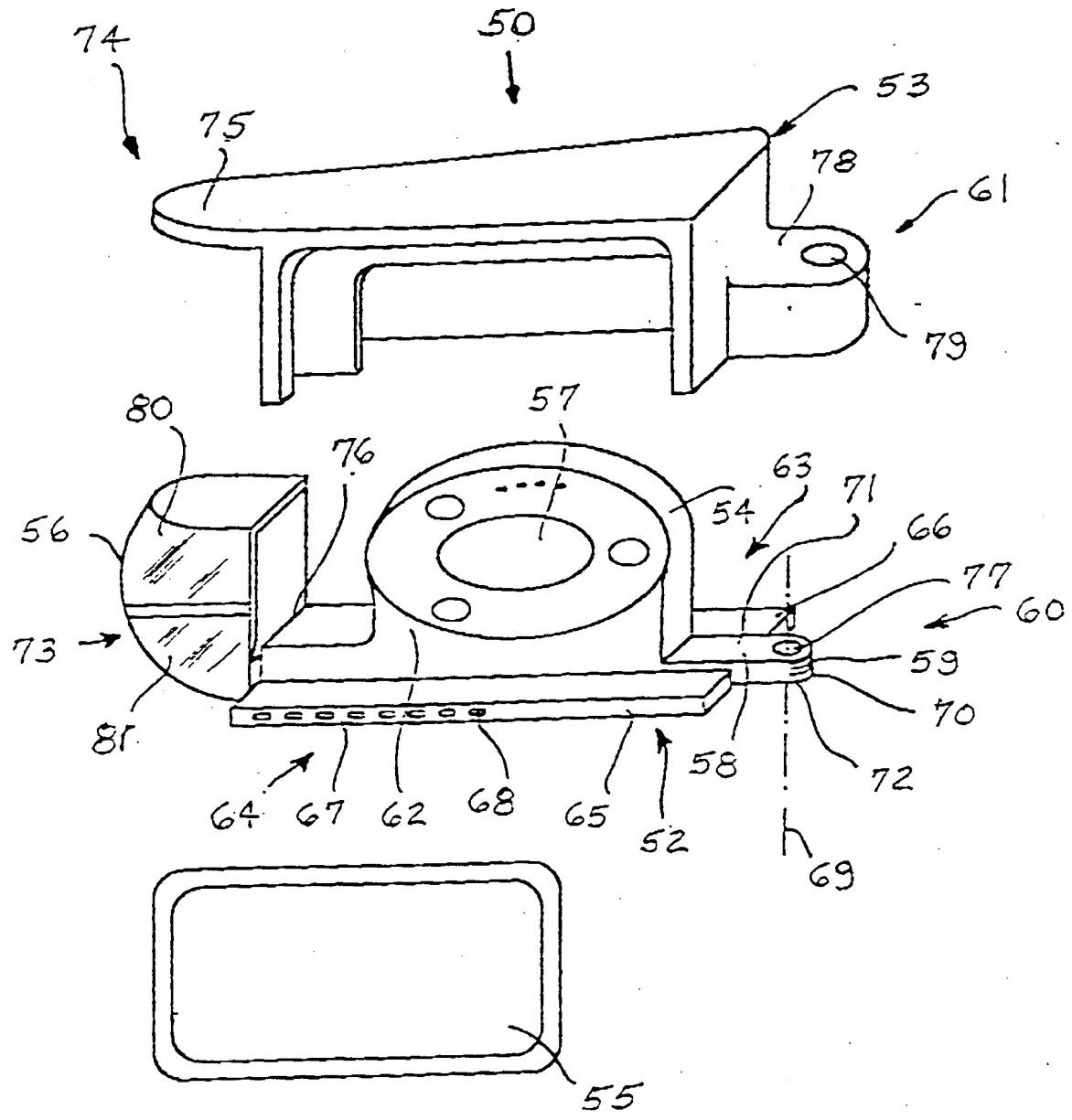


FIG. 2

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